APPENDIX I
Conservation

OVERVIEW

The 2000 Lower West Coast (LWC) Regional Water Supply Plan recommended plumbing retrofits for both interior plumbing fixtures and rain sensors for automatic landscape irrigation systems; continuation/expansion of the Mobile Irrigation Laboratory (MIL) Program; and, voluntary conversion of agricultural seepage irrigation systems to microirrigation in the Lower West Coast (LWC) Planning Area. Based on consensus from stakeholders and the analysis associated with this plan, it was concluded that the 2000 plan recommendations remain valid and should continue to be implemented.

Water conservation options were selected from *The Florida Water Conservation Initiative's* (FDEP 2002) list of potential conservation measures. These are the methods best suited to the scope of the regional water supply plan. Options with the greatest potential water savings were identified; relevant information was assembled, such as laws, ordinances and District rules; and, age of housing stock in the LWC Planning Area were considered and analyzed. An analysis of potential conservation water savings was performed. Funding mechanisms for the recommended alternatives are also discussed in this appendix.

AGRICULTURE IRRIGATION CONSERVATION

Citrus is the dominant crop in the LWC Planning Area. Over 66 percent of the citrus acreage in the planning area uses low-volume technology or microirrigation, while the remaining acreage uses flood irrigation. Conversion of citrus acreage now using flood irrigation to microirrigation will continue to increase water savings

In 2004, the South Florida Water Management District (SFWMD or District) responded to a request from the Institute of Food & Agricultural Sciences (IFAS), University of Florida, to become a funding participant in the Florida Automated Weather Network (FAWN). This network of weather stations provides real-time and historical data to water users (agricultural, as well as urban landscape) for making informed irrigation decisions.

Agricultural Best Management Practices

The Best Management Practices (BMPs) Program, authorized by Section 403.067, Florida Statutes (F.S.), was developed to help farmers improve water quality. The BMPs programs are voluntary and were developed in cooperation with specific agricultural commodity groups. The commodity groups that presently have BMPs programs in place or under development are Cattle, Citrus (Indian River area and Ridge area), Green Industries (landscape, nurseries and golf courses), Horses, Silviculture (forestry) and Vegetables. In the LWC Planning area, Nursery BMPs mobile irrigation labs (MILs) are implementing the nursery BMPs.

Section 403.021, F.S., mandates the involvement of the SFWMD in the BMPs Program. Administered by the Florida Department of Agriculture and Consumer Services (FDACS), the BMPs Program involves several state, federal and local agencies. The Florida Department of Environmental Protection (FDEP) sets allowable pollution limits called Total Maximum Daily Loads (TMDLs) for nutrients. Resource Conservation and Development Corporations and Soil and Water Conservation Districts provide local support for BMP programs. The University of Florida IFAS evaluates individual grove owners' BMP compliance and has written the *Water Quality/Quantity BMPs for Indian River Area Citrus Groves*. The United States Department of Agriculture–Natural Resources Conservation Service (USDA–NRCS) provides technical assistance and some additional cost-sharing for the program.

One of the major incentives to join the BMPs Program is a cost-sharing arrangement with the Florida Department of Agriculture and Consumer Services (FDACS) on implementation costs. The SFWMD provides financial and technical assistance for the program startup.

Agricultural Mobile Irrigation Labs

The Mobile Irrigation Lab (MIL) Program began in south Florida in 1989 with an agricultural lab in the LWC Planning Area. Since then, the agricultural MIL in this region has been serving Collier, Lee, Hendry Glades and Charlotte counties.

The mission of the labs is to educate and demonstrate to agricultural and urban water users how to irrigate efficiently. Currently, there are 15 operational labs throughout the District. Twelve counties are served by the labs. Ten MILs are District-funded and five are funded by other sources. Four of these MILs provide agricultural evaluations. Funding is a multi-agency partnership between federal, state, regional and local levels of government. The agencies currently funding MILs are the USDA–NRCS, the SFWMD and the SFWMD's Big Cypress Basin Board, various Soil and Water Conservation Districts, the FDACS, and various county and local governments. Since 2001, recommendations for improvements to irrigation systems have yielded average annual potential water savings of 0.9 million gallons per day (MGD).

URBAN WATER CONSERVATION

Utilities in the LWC Planning Area have promoted water conservation through traditional methods, such as public outreach and customer information. The utilities in this region have implemented the Consumptive Use Permit (CUP) Program water conservation requirements, resulting in implementation of water conservation programs and adopted conservation ordinances.

The approach to evaluating the best conservation measures for the LWC Planning Area was a repetitive one. The evaluation process entailed identifying characteristics of

the planning area, such as age of housing stock, that would likely determine the type or respective age of technology of indoor plumbing devices, and characterizing use patterns by service area and per capita trends (**Table 1**).

Table 1. Examples of How Alternatives are Evaluated.

Planning Area Housing Characteristic	Best Opportunity	Conservation Measure
Indoor - older housing with inefficient indoor plumbing fixtures	Retrofits	Plumbing (e.g., toilets, showerheads, etc.)
Outdoor – irrigation systems that do not respond to rainfall	Retrofits	Rain shut-off switches
New development	Local ordinances/ codes/regulatory measures	Varies from code enforcement to landscape technology, such as Xeriscape™

Indoor Water Use

Two significant changes occurred in plumbing standards in 1983 and 1994, which affected residential water use. In 1983, Chapter 553, F.S., was modified, lowering the maximum allowable flow rates for water fixtures in new construction to a maximum use of 3.5 gallons per flush for toilets and a flow rate of 3.0 gallons per minute (GPM) for showerheads. Prior to this state legislation, the typical volume of water for toilet flushing was 6.0 gallons and showerhead flow was 6.0 GPM.

In 1994, new plumbing standards for water use were implemented under the Federal Energy Policy Act of 1992, setting national plumbing code standards of 1.6 gallon per flush for toilets, 2.5 GPM for showerheads and 2.0 GPM for faucets.

Methodology

In order to determine urban areas with the greatest potential for retrofits in the LWC Planning Area, a housing stock analysis was performed using age of housing as a determinate of the age and water use characteristics of plumbing fixtures. County property assessors parcel data for Charlotte, Collier, Glades, Hendry and Lee counties provided the number and age of residential units. The age of the residential units was compared to years when the plumbing code changed as described previously (pre-1984, 1984–1994, 1994–2000).

Table 2 shows the number of units and percentages of housing in each group for Charlotte, Collier, Glades, Hendry, and Lee counties.

Table 2. Age of Housing Stock in Lower West Coast Counties (Indoor Retrofit).

County	Housing Stock			
	Pre 1984	1985-1994	Post 1994	Total
Charlotte[a]	90 48%	70 37%	27 14%	187
Collier	28,282 43%	20,789 32%	16,925 26%	65,996
Glades[a]	1,383 68%	454 22%	200 10%	2,037
Hendry[a]	5,068 61%	2,389 29%	818 10%	8,275
Lee	87,506 55%	44,946 28%	26,619 17%	159,071
Grand Total	122,329 52%	68,648 29%	44,589 19%	235,566

a. Portions of these counties in the LWC Planning Area. Source: Tax assessors

Costs and Savings

Utilities that would benefit most from plumbing fixture retrofits are those with significant housing in the pre-1984 age category, and therefore have the most potential for indoor water savings.

Water savings derived from retrofitting pre-1984 housing to current standards is 4.4 gallons per flush for toilets, and 3.5 GPM for showerheads. Toilets are estimated to be flushed five times a day, while 10 minutes per shower is a standard estimate. According to the 2000 U.S. Census, number of persons-per-household was 2.18 in Charlotte County, 2.39 in Collier, 2.51 in Glades County, 3.09 in Hendry County and 2.31 in Lee County.

Annual savings from retrofitting one unit from the pre-1984 technology to current standards would be 32,000 gallons for each retrofitted showerhead and 20,075 gallons for each retrofitted toilet.

For the purposes of this approach, it is assumed that a retrofit program would include 75 percent of the pre-1984 housing stock. This percentage is typically used as an estimate of expected coverage in an urban retrofit program, as some retrofits have already been done, some units are vacant or on the market, or for other reasons will not be part of the program. Using the county housing age data in **Table 2**, and assuming the 75 percent retrofit, the total potential annual savings of a showerhead retrofit is 0.005 MGD for Charlotte County; 1.80 MGD for Collier County; 0.09 for Glades County; 0.41 MGD for Hendry County; and, 5.30 MGD for Lee County, for a total of 7.60 MGD in the LWC Planning Area.

Similarly, using the housing age data in **Table 2**, and assuming the 75 percent retrofit, total annual savings of a toilet retrofit is 15.003 MGD for Charlotte County; 1.12 MGD for Collier County; .006 MGD for Glades County; 0.26 MGD for Hendry County; and. 3.34 MGD for Lee County, for a total potential savings of 4.48 MGD in the planning area.

Total annual savings for both toilet and showerhead retrofits is 0.01 MGD for Charlotte County; 2.89 MGD for Collier County; 0.15 MGD for Glades County; 0.67 for Hendry County; and, 8.64 MGD for Lee County, for a total potential savings of 12.36 MGD. This estimate assumes one retrofit of each device per housing unit.

Whenever indoor water use is reduced, there is also a reduction in wastewater. Wastewater flows have been estimated to be as much as 50 percent of residential water use. Impacts to wastewater treatment facilities and the need for expansion and disposal can be reduced if water use is reduced.

Table 3 shows the estimated savings that could be accrued in the LWC Planning Area if the three retrofit measures are implemented, as well as the costs and assumptions used in the calculations. Costs for retrofits are $200 per toilet retrofit and $20 per showerhead, as described in the *Consolidated Water Supply Plan Support Document* (SFWMD 2006). Water conservation cost-efficiency is expressed in 1,000 gallons of water saved annually. Toilet retrofits cost $.25 per 1,000 gallons of water saved, and showerhead retrofits cost $.06 per 1,000 gallons of water saved.

The estimated amount of water that could potentially be conserved in the LWC Planning Area is 22.30 MGD for urban use within the 20-year planning horizon as a result of retrofit conservation measures. Achieving this savings, however, is highly dependent on cooperating utilities.

Table 3. Savings Achieved by Implementing the Recommended Measures for Conservation in the LWC Planning Area.

Housing Stock Characteristic	Conservation Measure	Water Savings per Retrofit Device	Cost per Device	Cost per 1,000 gallons	Planning Area Savings Based on Retrofit of 75% of Characteristic Housing Stock	Estimated total Cost in Millions
Housing Built before 1984	Showerhead retrofit	3.5 gallons/minute	$20	$.06/1,000	7.6 MGD	$1.83
Pre-1992 Outdoor Irrigation Systems Without Rain Sensors	Rain sensor installation	74 gallons/day	$68	$1.07 /1,000	9.9 MGD	$9.12
Housing Built before 1984	Toilet retrofit	4.4 gallons/flush	$200	$.25/1,000	4.8 MGD	$18.35
Planning Area Savings					22.3 MGD	$29.30

Note: Based on Housing Counts from Tax Assessors data.

Urban Landscape Irrigation

Methodology

Rain sensor cut-off devices have been demonstrated to be an effective means of reducing wasteful irrigation in automatic systems when local rainfall has met the immediate irrigation requirement. To determine housing with the greatest potential for outdoor retrofits, age of the housing unit was compared to the law related to rain sensor changes (pre-1992 and 1992–2000). The percentages of units constructed in the two time periods are described for each county. Data for **Table 4** were obtained from county property assessors parcel data as previously described.

For this evaluation, water savings derived from installing rain sensors for housing stock built prior to 1992 is estimated. Based on the county housing age data in **Table 4**, and assuming 75 percent of the housing units are retrofitted, a total savings of 9.93 MGD is estimated for the LWC Planning Area (0.01 MGD for Charlotte County; 2.52 MGD for Collier County; 0.10 MGD for Glades County; 0.39 MGD for Hendry County; and, 6.92 MGD for Lee County).

Installing rain sensors in irrigation systems of housing units constructed prior to the 1991 Xeriscape™ Landscaping law would result in the greatest savings. For those systems using reclaimed water, additional efficiencies can be realized using metering.

Table 4. Age of Housing Stock in Lower West Coast Counties (Rain Sensor).

County	Housing Stock		
	Pre 1992	Post 1992	Total
Charlotte[a]	143 76%	44 24%	187
Collier	45,443 69%	20,553 31%	65,996
Glades*	1,726 85%	311 15%	2,037
Hendry*	6,940 84%	1,335 16%	8,275
Lee	124,601 78%	34,470 22%	159,071
Grand Total	178,853 76%	56,713 24%	235,566

a. Portions of these counties in the LWC Planning Area. Source: Tax assessors

Costs and Savings

Rain sensors can provide a significant reduction in water use for nominal cost. The cost is estimated to average $68 per rain sensor, including installation, and can save 12,700 gallons per year. This equates to a cost of $1.07 per 1,000 gallons. The useful life of a rain sensor is estimated to be five years. Areas benefiting the most from a rain sensor retrofit program would be pre-1994 housing units with in-ground irrigation systems.

Urban Mobile Irrigation Labs

In the LWC Planning Area, there are four urban labs. Two of these labs, one in Collier and one in Lee County, are funded by the District Mobile irrigation lab personnel evaluate the effectiveness of irrigation systems and then make recommendations on how the systems can be made more efficient. The result is savings in water, energy, time and money for the user.

CONSERVATION MEASURES

Table 5 provides a general list of recommended conservation measures that would be effective in different types of utility service areas based on the population growth rate, housing stock and potential for growth.

The SFWMD actively engages in devising programs for retrofits, and has dedicated outreach specialists and intergovernmental representatives to assist utilities, local governments and water users to achieve the goals of this plan update. The District's Water Savings Incentive Program (WaterSIP) is tailored to assist the community to

partially fund projects, such as large-scale retrofits, as recommended by this plan update. Through the WaterSIP, the SFWMD will continue to provide matching funds up to $50,000 to water providers for water-saving technologies.

Table 5. Utility Characteristics and Conservation Methods.

Type of Utility	Characteristics of Utilities	Utility Specific Recommendations
Large Growth Potential	Considerable existing housing stock of intermediate to old age, significant land available for new development	Indoor retrofits, Xeriscape™ ordinance, irrigation hours ordinance, outreach and education
Moderate Growth Potential	Existing housing stock intermediate in age, moderate potential for development – limited by boundaries of other utility service areas and natural areas	Indoor retrofits, Xeriscape™ ordinance, irrigation hours ordinance, promote Mobile Irrigation Lab, outreach and education
Limited Growth Potential	Housing stock is older, service area is near build-out, very limited potential for growth	Indoor retrofits, rain sensor installation, promote Mobile Irrigation Lab, outreach and education

The SFWMD will also provide increased technical assistance, as well as outreach and education efforts in the LEC Planning Area. These efforts include annual conservation workshops held at the service center to showcase the District's funding programs for conservation and alternative water supplies; funding support for annual WaterFest events; support of Florida Yards and Neighborhoods; and, MIL educational efforts. Savings may vary from year to year as programs are implemented.

CONSERVATION – IMPLEMENTATION STRATEGIES

The following are potential strategies for water conservation that were developed in cooperation with the public:

- Landscape irrigation water conservation has the potential for significant water savings, and has the potential to reduce Surficial Aquifer System resource issues. This may be accomplished by expanding MIL activity in the planning area, and may involve local government funding partnerships to increase lab services, especially in newer urban communities.
- Local governments should consider developing ordinances to address water-conserving landscape installation for new construction to maximize water savings in initial design and operation of both residential and commercial sites.
- Implement cost-effective indoor and outdoor retrofits in the LWC Planning Area based on the preceding analyses.
- Complete water conservation rulemaking for Chapter 40E-2, F.A.C., and the *Basis of Review for Water Use Permit Applications*, emphasizing goal-based conservation programs for public water suppliers and major water users.
- Fund projects through the WaterSIP, including public/private partnerships, which further the preceding recommendations.
- Expand outreach and education through funding, public/private partnerships, the media, professional organizations and users.

REFERENCES CITED

Florida Department of Environmental Protection. 2002 *Florida Water Conservation Initiative.* FDEP, Tallahassee, FL. vari. pag.

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